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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Chong Cook Kim

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5223

7590

02/10/2005

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EXAMINER

MENEFEE, JAMES A

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 02/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/617,833	KIM ET AL.	
	Examiner	Art Unit	
	James A. Menefee	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 12-16 is/are rejected.
- 7) ☒ Claim(s) 10 and 11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |                                                                                                                                                |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                           | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/14/2003</u> . | 6) <input type="checkbox"/> Other: ____.                                                |

## **DETAILED ACTION**

### ***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Specification***

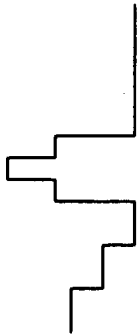
The disclosure is objected to because of the following informalities: on page 4, line 14, it appears that a word such as --solve-- or --remedy-- is missing and should be added between the words "to" and "this". Appropriate correction is required.

It appears that Tables 1 and 2 (p. 20-21) may be switched. Table 1 is disclosed as showing the layers for the device of Figs. 5a-5b (i.e. that of the present invention), while Table 2 is disclosed as a conventional laser. However, it is Table 1 that appears to be conventional, while Table 2 appears to be according to the invention. Table 1 includes only asymmetric claddings, like shown in prior art Fig. 1, but Table 2 shows first through third lower clad layers, one of which is a high refractivity layer as in the present invention. This inconstancy must be corrected.

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the features of claim 16 must be shown or the feature(s) canceled from the claim(s). While the figures do show an embodiment with first second and third lower clad layers (Fig. 5), there is not shown in the figures such an

embodiment where the first lower clad (i.e. 59c) has a higher refractivity than the second (i.e. 59b). That is, a refractivity graph is needed similar to:



No new matter should be entered. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3-5, 7, and 12-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Reid (US 2003/0210720).

Regarding claim 1, See esp. Figs. 1-4. Reid discloses a semiconductor laser comprising a semiconductor substrate (11), a lower clad layer (can be interpreted as layer 9', layer 9 (as in Fig. 1), or combination of both layers 9' and 9) formed on the substrate, active region (12) which includes a lower guide, active layers, and upper guide (see explanation below), upper clad (8) formed on the active region (and thus on the upper guide), wherein the lower and upper clad layers have the same refractivity (see  $n_8$ ,  $n_9$ , and  $n_{9'}$  of Figs. 2 or 4) and the lower clad includes a high refractivity layer (1) spaced from the active region by a constant distance (i.e. the width of clad part 9) with a refractivity ( $n_1$ ) higher than the refractivity ( $n_8$ ) of the upper clad layer.

The active region (12) includes an active layer (including quantum wells and barriers) that is surrounded by "sublayers". See par. [0054]. These sublayers, corresponding to the first step upward in the refractive index profile of the active layer (i.e. the step up leftward from  $n_9$  and up rightward from  $n_8$  in Fig. 4), correspond exactly to the "guide layers" of the present invention (see present application Fig. 3 reference numbers 36 and 38, providing similar steps

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upward in the refractive index profile toward the active layer), and therefore even though these sublayers are not called “guide layers”, they are interpreted as such. Note that while the sublayers are described in Reid with reference to Fig. 1A, like reference numbers identify like elements (see par. [0058]) therefore this is also disclosed as to Fig. 3, and furthermore the refractive index profiles of each of Figs. 2 and 4 seem to include these sublayers.

Regarding claims 3-4, as can be seen in Figs. 2 and 4, the sublayers described above have the same thickness and refractive index.

Regarding claim 5, high refractivity layer (1) is disposed between substrate (11) and lower clad (9).

Regarding claim 7, the high refractivity layer (1) is disposed in lower clad layer (9',9) in Fig. 3.

Regarding claim 12, see Figs. 1-2. Reid discloses a semiconductor laser comprising a semiconductor substrate (11), a first lower clad layer (1) formed on the substrate, a second lower clad layer (9) formed on the substrate, an active region (12) including an active layer between upper and lower guide layers (see rejection of claim 1 above), an upper clad layer (8) formed on the upper guide layer, wherein the second lower clad (9) and the upper clad layer (8) have a first refractivity ( $n_8$  and  $n_9$  which are equal, see Fig. 2), and the first lower clad (1) has a second refractivity ( $n_1$ ) higher than the first refractivity ( $n_8$  or  $n_9$ ).

Regarding claim 13, see Figs. 3-4. Reid discloses a semiconductor laser comprising a semiconductor substrate (11), first, second, and third lower clad layers (9', 1, 9) formed sequentially on the substrate, an active region (12) including an active layer between upper and lower guide layers (see rejection of claim 1 above), an upper clad layer (8) formed on the upper

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guide layer, wherein the third lower clad (9) and the upper clad layer (8) have a first refractivity ( $n_8$  and  $n_9$  which are equal, see Fig. 4), and the second lower clad (1) has a second refractivity ( $n_1$ ) higher than the first refractivity ( $n_8$  or  $n_9$ ).

Regarding claim 14, Reid further discloses the first lower clad (9') has the same refractivity ( $n_9$ ) as that of the third lower clad ( $n_9$ ).

Claims 1, 4, 7-9, and 12-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Takeuchi et al. (US 2003/0031220). See especially Figs. 1 or 2 and 4A-C and the discussion thereof.

Regarding claim 1, Takeuchi discloses a semiconductor laser comprising semiconductor substrate (10), lower clad layer (11a, 11b) formed on the substrate, and active region (12) including lower and upper guide layers and an active layer (see pars. [0031], [0063]), an upper clad layer (13) formed on the upper guide layer, wherein the lower and upper clad have the same refractivity (see Fig. 4B, 11a, 11b, and 13 are the same) and the lower clad layer includes a high refractivity layer (11c) spaced from the lower guide layer by a constant distance (i.e. thickness of 11b) with refractivity higher than that of the upper clad layer (11c is higher than 13, see Fig. 4B).

Regarding claim 4, the upper and lower guide layers have the same composition and therefore the same refractivity. See par. [0063].

Regarding claim 7, the high refractivity layer (11c) is disposed within lower clad (11a, 11b).

Regarding claims 8-9, the active layer and guide layers are made of an AlGaAs based material (par. [0063]), the upper clad (13) is a p-type AlGaAs based material, and the lower clad

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(11a, 11b) is an n-type AlGaAs based material (par. [0058]). While it is not explicitly disclosed that the active and guide layers are i-type, this is implicit from the disclosure. All of the other layers that are either n or p type are labeled as such, therefore since Takeuchi did not label these layers it is implicit that they are meant to be neither n nor p, therefore they are i. This is furthermore a reasonable interpretation of Takeuchi since typically the active region of a laser is not n or p type (though not relied upon in this rejection, see Buda et al. (US 2004/0028104, Table 1) (active layers undoped) and Reid par. [0043] (active region typically i-type)).

Regarding claim 12, Takeuchi discloses a semiconductor laser comprising a semiconductor substrate (10), a first lower clad layer (11c) formed on the substrate, a second lower clad layer (11b) formed on the substrate, an active region (12) including an active layer between upper and lower guide layers (see rejection of claim 1 above), an upper clad layer (13) formed on the upper guide layer, wherein the second lower clad (11b) and the upper clad layer (13) have a first refractivity (see Fig. 4B), and the first lower clad (11c) has a second refractivity higher than the first refractivity (See Fig. 4B).

Regarding claim 13, Takeuchi discloses a semiconductor laser comprising a semiconductor substrate (10), first, second, and third lower clad layers (11a, 11c, 11b) formed sequentially on the substrate, an active region (12) including an active layer between upper and lower guide layers (see rejection of claim 1 above), an upper clad layer (13) formed on the upper guide layer, wherein the third lower clad (11b) and the upper clad layer (13) have a first refractivity (see Fig. 4B), and the second lower clad (11c) has a second refractivity higher than the first refractivity (see Fig. 4B).



Regarding claim 14, Takeuchi further discloses the first lower clad (11a) has the same refractivity as that of the third lower clad (11b).

Claims 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Onomura et al. (US 2002/0039374). See Figs. 1-2.

Regarding claim 12, Onomura discloses a semiconductor laser comprising a semiconductor substrate (10), a first lower clad layer (12) formed on the substrate, a second lower clad layer (13) formed on the first lower clad, a lower guide layer (14) formed on the second lower clad, an active layer (16) formed on the lower guide, an upper guide layer (18) formed on the active layer, an upper clad layer (19) formed on the upper guide, wherein the second lower clad (13) and the upper clad (19) have a first refractivity, and the first lower clad (12) has a second refractivity higher than the first refractivity. See Fig. 2 for refractivities.

Regarding claim 13, Onomura discloses a semiconductor laser comprising a semiconductor substrate (10), a first, second, and third lower clad layers (11, 12, 13) formed on the substrate, a lower guide layer (14) formed on the third lower clad, an active layer (16) formed on the lower guide, an upper guide layer (18) formed on the active layer, an upper clad layer (19) formed on the upper guide, wherein the third lower clad (13) and the upper clad (19) have a first refractivity, and the second lower clad (12) has a second refractivity higher than the first refractivity. See Fig. 2 for refractivities.

It is noted that Onomura does not specifically refer to layers (11) and (12) as “clad” layers; only layers (13) and (19) are referred to as clad layers. However, since the layers (11) and (12) are located in the same location as the clad layers in the present invention, and further have

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similar refractive indexes relative to the other layers, then it is reasonable to interpret them as “clad” layers.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid. Reid discloses the limitations of parent claim 1 as shown above.

Regarding claim 2, the claim requires the high refractivity layer be spaced from the lower guide layer by a distance greater than half the total thickness of the active layer and guide layers. In Reid, this spacing of the high refractivity layer (1) corresponds to the thickness of clad (9), and the total of the active and guide layers corresponds to total active region (12), therefore the question is whether the thickness of clad (9) is greater than one half the thickness of active region (12).

Regarding claim 6, the same spacings are claimed, therefore the question here is whether the thickness of clad (9) is less than three times the thickness of active region (12).

Reid discloses the thickness of clad (9) is 0.1 – 0.7  $\mu\text{m}$  (par. [0046], [0059]), and that the thickness of active region is from less than 0.1  $\mu\text{m}$  up to 1.0  $\mu\text{m}$  (par. [0047]). There are no specific examples, and this does not teach the claimed ranges with sufficient specificity, therefore the claimed ranges are not anticipated. *See* MPEP 2131. However, in the case where

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the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Similarly, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). *See also* MPEP 2144.05. In the present case, Reid discloses ranges for the thickness of each layer, and said ranges will yield values that fall within the claimed ranges, therefore it can be said that the claimed and prior art ranges overlap and a *prima facie* case of obviousness exists as per *Wertheim*. Furthermore, even assuming *arguendo* that the ranges do not overlap, since Reid and the present invention are doing the same thing (i.e. shifting the intensity profile of the beam toward the n side while maintaining a narrow far field) with very similar structure, one skilled in the art would have expected the ranges of each to have the same properties, and a *prima facie* case of obviousness exists as per *Titanium Metals*.

Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iordache et al. (Electronics Letters, Jan. 1999) in view of Reid.

Regarding claim 13, Iordache discloses a semiconductor laser comprising first, second, and third lower clad layers sequentially grown (see Fig. 1, regions moving from right to left on graph from 4.5 to 1.7 (first), 1.7 to 1.6 (second), and 1.6 to 1.5 (third)). There are lower guide layer (the graded layer), active layer, and upper guide layer (the other graded layer). Then there is upper clad (from about 1.1 to nearly 0 on the graph). The third lower clad and the upper clad

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have a first refractivity, and the second lower clad has a second refractivity higher than the first refractivity.

There is not disclosed a substrate on which the device is grown. Reid teaches a similar device where all of the layers are grown on a substrate (11). It would have been obvious to one skilled in the art to include the layers on a substrate, since it provides a low electrical resistance mechanical support to the laser structure, as taught by Reid. See par. [0046].

Regarding claim 15, Iordache discloses first lower clad layer has a refractivity higher than that of the third lower clad and lower than the second lower clad.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Onomura. Onomura discloses the limitations of parent claim 13 as shown above. Further, Onomura discloses that the first lower clad layer (11) has refractivity higher than the second lower clad layer (12). See Fig. 2. Onomura differs from claim 16 because claim 16 requires the refractivity of the first lower clad to additionally be less than that of the lower guide layer; in Onomura the refractivity of the first lower clad (11) is the same as that of the lower guide layer (14). See Fig. 2 (right edge of area 24 corresponds to lower guide). However, as noted above a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties.

*Titanium Metals Corp. of America*, 778 F.2d 775. Onomura does not specifically require the refractivities to be identical, and one skilled in the art would have no reason to think the properties would differ in any way if the refractivities were slightly altered such that the claimed

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range were met. Only one of the layers would need to be changed by the most minute amount, therefore one skilled in the art would expect the same properties in each.

*Allowable Subject Matter*

Claims 10-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 10, there is not taught or disclosed in the prior art a semiconductor laser having upper and lower clad layers having the same refractivity and a high refractivity layer included in the lower clad layer, where the high refractivity layer has an Al content of approximately 0.85 to approximately 0.97 times the Al content of the lower clad.

Similarly regarding claim 11, there is not taught or disclosed in the prior art a laser as just described where the high refractivity layer has an Al content of approximately 1.3 to approximately 2.5 times the Al content of the lower guide layer.

Note Takeuchi, cited above, where the Al content of the high refractivity layer (11c) is 0.3 (par. [0059]), the Al content of the lower clad (11a, 11b) is 0.5 (par. [0058]), and the Al content of the lower guide layer is 0.3 (par. [0063]). Therefore Takeuchi discloses the ratios as 0.6 and 1.0, rather than approximately 0.85 to 0.97 and approximately 1.3 to 2.5 respectively.

The remaining references cited herein also teach lasers having the high refractivity layer as claimed, but also do not teach these ratios of Al content. One skilled in the art would find no

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suggestion, other than impermissible use of applicant's disclosure, that these ratios should be altered from the prior art to those claimed.

To clarify the record since these claims are indicated allowable in the first office action, it should also be noted that the examiner did consider the obvious optimization of ranges rejections based on case law, *see* MPEP 2144.05 II, but did not feel they were appropriate. It seems that the numbers are sufficiently different that any optimization would require more than routine experimentation, and neither is it certain that the Al content of these layers would be a result effective variable.

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Nakayama (US 2004/0052282) and Buda et al. (US 2004/0028104) also disclose lasers including a similar high refractivity layer as claimed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (571) 272-1944. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'J. Menefee', with a stylized flourish at the end.

James Menefee  
February 4, 2005  
JM